NOAA FISHERIES
NATIONAL MARINE FISHERIES SERVICE

Authorizations and Permits for Protected Species (APPS)

File #: 16507
Title: Sturgeons in the mid-Atlantic; identification
Modification: 3

Applicant Information

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Project Information

File Number: 16507
Application Status: **Application Complete**
Project Title: Sturgeons in the mid-Atlantic; identification of critical habitats, population assessment and migratory paterns
Project Status: New
Previous Federal or State Permit:
Permit Requested:
- ESA Section 10(a)(1)(A) permit (other)

Where will activities occur? US Locations including offshore waters
Research Timeframe: **Start:** 04/04/2012 **End:** 04/05/2017

Sampling Season/Project Duration: Sampling will be conducted along the marine waters of Delaware beginning on/about April 1st and conclude by May 15th for each year. We will initiate coastal sampling again starting no earlier than October 15 and concluding by December 15th. This work is currently funded for 2012 although additional funding will be sought to continue through 2016.

In-river sampling for Atlantic sturgeon eggs and adults will take place during the period of likely spawning from May 15th through July 1st. This work is currently funded for 2012 although additional funding will be sought to continue through 2016.

Hydroacoustic assessment of sturgeons in the Delaware River will take place year round on a bi-monthly basis through 2014.

Abstract: I propose to use both a mix of both standard research techniques including gillnet surveys as well as more novel approaches involving the use of biotelemetry, and hydroacoustic assessment to provide much needed data for the conservation and ultimate recovery of Atlantic and shortnose sturgeons. My study has three primary objectives; 1-to provide detailed information on the location of Atlantic sturgeon spawning in the Delaware River. Specifically I will attempt to provide critically needed information on both the location and timing of spawning activity, estimates of sex-specific spawning intervals, as well as collecting genetic samples for future analyses. In addition, the use of compatible telemetry systems in the Delaware, Connecticut, and Hudson Rivers will allow for more precise estimates of interbasin exchange rates for adult Atlantic sturgeon in both segments of the New York Bight DPS. 2- Further refine and develop the application of side scan sonar technology to the remote sensing of habitat utilization for both Atlantic and shortnose sturgeon. Specifically we will provide information on the seasonal patterns of habitat utilization for both sturgeon species. This information on the patterns of habitat use will then be incorporated into predictive models which will increase the ability of managers to assess the potential impact of human related activities (e.g. dredging and water diversion projects) in the Delaware River. 3 I will also implement a coastal intercept sampling program designed to provide an index of recovery for Atlantic sturgeon in the mid-Atlantic Bight.

Project Description

Purpose:

Objectives

I will employ a combination of standard and relatively novel techniques to address three key objectives: 1-to provide detailed information on the location of Atlantic sturgeon spawning in the Delaware River, 2- further refine and develop the application of side scan sonar technology to the remote sensing of habitat utilization for both Atlantic and shortnose sturgeon, and 3- implement a coastal intercept sampling program designed to provide baseline information required to assess recovery for Atlantic sturgeon in the mid-Atlantic Bight

Project Significance

Objective 1- In the status review report, the ASSRT concluded that there is an extant, reproducing subpopulation of Atlantic sturgeon present in the Delaware River. This conclusion was also supported by the results of two recent genetic studies (Grunwald et al. 2007, Wirgin et al. 2007) which noted the existence of a relict spawning population of Atlantic sturgeon in the Delaware River. More recently numerous collections of both YOY and age-1 Atlantic sturgeon in the Delaware have confirmed the existence of this spawning population (DNREC 2009). An additional finding of the SRT was the overall lack of basic biological data including habitat requirements for many of the Atlantic sturgeon subpopulations including the New York Bight DPS which includes the Delaware River. I will address these data needs by providing much needed data on the characteristics of Atlantic sturgeon spawning sites in the Delaware River.

Objective 2- Fisheries managers have struggled with developing a better understanding of critical habitat for threatened and endangered species including both Atlantic and shortnose sturgeon. Standard techniques for assessing sturgeon habitat needs including biotelemetry and surveys (e.g. gillnets or trawls) are typically limited by either sample size (biotelemetry) or regulatory constraints (e.g. bycatch mortality). As such, fisheries professionals have recently began looking towards hydroacoustic techniques for developing a better understanding of sturgeon habitat requirements. My project will provide a large scale assessment on the feasibility of using hydroacoustic techniques to assess sturgeon populations. Specifically we will use a side scan sonar system to develop estimates of relative density for sturgeons with associated habitat types for the Delaware River.

Objective 3- It is generally assumed that Atlantic sturgeon populations have suffered as a result of habitat destruction and overharvest. If Atlantic sturgeon are listed under the ESA recovery will be monitored through population metrics. There are a number of issues associated with assessing recovery with fishery dependent data including changes in fishing gear and modifications of harvester behavior. Through our coastal sampling program targeting adult and large juvenile Atlantic sturgeon I will establish a standardized fishery-independent sampling program which will build on three years of existing data (2009-2011) and provide a metric for assessing recovery in this imperiled species.

Hypotheses

Objective 1- this portion of the project is descriptive in nature and will focus on the linking the location of telemetered adult Atlantic sturgeon during likely spawning times and the collection of fertilzed eggs to characterize spawning sites. I will assess the role of sex and maturity in mediating spawning behavior. Ho: sex and reproductive stage do not influence the behavior of adult Atlantic sturgeon during river residency.

Objective 2- this project is descriptive in nature although we will be able to assess the role that habitat plays in determining the spatial occupancy patters of shortnose and Atlantic sturgeons. Ho: habitat does not play a role in structuring the spatial occupancy patterns of shortnose and Atlantic sturgeons.

Objective 3- this project is descriptive in nature and will focus on providing data for assessing the recovery of Atlantic sturgeon in the mid-Atlantic Bight. As such it is likely to be descriptive in nature although the movements of telemetered Atlantic sturgeon in marine waters will allow for an examination of factors which may play a role in mediating movement (e.g. temperature, salinity, day length).

Description: Since 2004 scientists at Delaware State University (DSU) have been working to develop a better understanding of Atlantic sturgeon habitat needs in the Delaware River. Although we have yet to gather conclusive evidence of spawning activity (i.e. fertilized Atlantic sturgeon eggs) we have been able to document the presence of ripe adults in the Delaware River during periods of likely spawning (Simpson and Fox 2007). The presence of ripe individuals, likely spawning behavior (Fox et al 2000), and recent genetic evidence (Grunwald et al. 2007, Wirgin et al. 2007) all strongly suggest the continued existence of a remnant spawning population of Delaware River Atlantic sturgeon. Our work will help provide managers specific data on the location and timing of spawning in the Delaware River. In addition through this proposal we will begin to develop an understanding of interbasin exchange rates between the two subpopulations of the New York Bight DPS. Finally, this project will provide a means to link fish collected during their coastal migratory phase (Laney et al. 2007) with their river of origin through both genetic identification as well as long term monitoring of migratory behaviors.

The recent development of relatively low cost side scan sonar systems which can be deployed from small vessels has allowed fisheries managers to explore their use in assessing the habitat requirements for various sturgeon species. This work has been successfully conducted in both lake (Thomas and Haas 2004) and riverine environments (Jacobson and Laustrup 2000). The proof-of-concept evaluation for the use of side scan sonar in the Delaware River to image shortnose sturgeon was recently concluded (ERC 2006). The results of this study are encouraging to regional fisheries professionals as they validate the use of side scan sonar in the rapid assessment of sturgeon habitat requirements.

The projects being undertaken through this permit application are not duplicative with other known sturgeon projects in the mid-Atlantic Bight.

The proposed study plan is contingent upon getting access to both Atlantic and shortnose sturgeon. Without being given permission to handle these species we will not be able to identify spawning locations, ground truth hydroacoustic assessments, and assess population recovery for Atlantic sturgeon.

Methods

Objective 1 (Spawning Site Identification): Sampling for adults and juveniles will be conducted in both the fall (Mid- October through December) as well as the spring (late March through April) along the Delaware Coastline. The timing and location of sampling will be conducted in such a way as to minimize potential interactions with marine mammals as well as to intercept the coastal migration of Atlantic sturgeon. Sampling for adult sturgeon (>1.3m, Van Eenennaam et al. 1996) and large (>800mm) juvenile Atlantic will be conducted using anchor gill nets during their coastal migration. Nets will be built and fished so as to be in compliance with both the Harbor Porpoise Take Reduction Requirement as well as the Atlantic Large Whale Take Reduction Program. The proposed monofilament gillnets are based on a design used to collect adult Atlantic sturgeon in the coastal intercept fishery. Due to the low temperatures, tending of nets, and large mesh size, any incidentally captured fish should be released alive and in good condition. Nets will be fished in accordance with developed protocols (Damon-Randall et al. 2011).

Suitably sized Atlantic sturgeon will be handled in accordance developed protocols for the implantation of transmitters (Fox et al. 2000, Damon-Randall et al. 2011). We will implant up to 30 adult and 30 juvenile Atlantic sturgeon with VEMCO Ltc. V-16 6H and 4H transmitters per year of this three year tagging effort. These transmitters are fully compatible with the equipment used by most sturgeon researchers on the Atlantic coast.

Upon capture, Atlantic sturgeon will be placed in a live well approximately 1000? in capacity with water pumped directly from the sampling site, maintaining ambient temperature, salinity and dissolved oxygen levels. Total length (TL), fork length (FL) (cm) and weight (kg) will measured and recorded. Using an AVID® Power Tracker 8 or Biomark® FST2001FT PIT tag reader, Atlantic sturgeon will be scanned for the presence of an existing PIT tag (passive integrated transponder). If no tag is found, a PIT tag will be inserted on the left side of the fish at the base of the dorsal fin (Fuller et al. 2008). A 1-1.5 cm2 genetic sample will be collected from the pectoral fin placed in 95% ethanol for future genetic analysis. A t-bar tag supplied by USFWS will be inserted into base of the dorsal fin according to previously developed protocols (Damon Randal et al. 2010).

If an Atlantic sturgeon are considered large enough (>60.0cm FL) to receive a transmitter (VEMCO V-16, 6-H and 4-H, 69.0 kHz), implantation protocols developed by Fox et al. for Gulf sturgeon (2000) will be utilized. Anesthetic (tricaine methane sulfonate MS-222®) will added to the live well at a dosage of 50-125 mg/l (Harms and Bakal 1994). When the Atlantic sturgeon cannot maintain equilibrium and exhibited signs of slowed

respiration, it will be placed in a sling, ventral side up, while its head and mouth remained submerged. An incision will be made off the centerline of the abdomen, a gonadal tissue sample will be taken and placed in a vial containing 10% buffered formalin for sexual identification and reproductive stage for Atlantic sturgeon greater than 133.0cm FL (Van Eenennaam et al. 1996), and a transmitter will be inserted into a subset of individuals. Transmitters will be coated with Dow Corning Silastic® biologically inert silicone elastomer in an attempt to minimize rejection rates (Boyd Kynard, USGS, Conte Anadromous Fish Laboratory, personal communication). Four to six sutures were used to close the incision using sterilized suture material (PDSII, size 1), and a mixture of Vaseline® mixed with Betadine® ointment will be used to coat the suture location. Oxytetracycline will be administered as an antibiotic at a dose of 1.0ml per 20kg body weight near the base of the dorsal fin, with a half-dose anterior to the PIT tag and a half-dose posterior of the PIT tag. Atlantic sturgeon will be allowed to recover and will then be released near the location of capture.

If an individual Atlantic sturgeon is not receiving an acoustic transmitter we will measure and weigh it before scanning it for the presence of a PIT tag and collecting a genetic sample. If an individual does not already have a PIT tag we will implant one prior to release at the location of capture.

Confirmation of spawning will be conducted by placing an array of egg samplers (McCabe 1990, Fox et al. 2000) to collect fertilized Atlantic sturgeon eggs and larvae. When adult Atlantic sturgeon occupy areas where suitable habitat is thought to exist (i.e. freshwater and hard bottom habitats; as determined through field observations using the guidance of the Sedimentological and geophysical survey of the upper Delaware Estuary (Sommerfield and Madsen 2003)) (Gilbert 1989; Smith and Clugston 1997) sampling for fertilized eggs will be conducted using an array of artificial substrates similar to ones designed for collection of Gulf of Mexico sturgeon eggs (Marchant and Sutters 1996), substrates will be hauled to check for the presence of Atlantic sturgeon eggs every 48-72 hours. Depth, temperature, oxygen, substrate composition, and conductivity will be measured as stated previously at all artificial substrates locations to characterize spawning site characteristics. Up to 100 Atlantic sturgeon eggs will be retained in 95% ETOH for genetic and reference samples, the rest will be enumerated and returned to the area where captured and allowed to hatch (Damon-Randal et at. 2010). This method of using telemetered fish to direct placement of artificial substrates has proven successful in both shortnose (Kieffer and Kynard 1993) and Gulf of Mexico sturgeon (Fox et al. 2000).

Objective 2 (hydroacoustic assessment): During the first year of the planned project we will concentrate our efforts in areas of known Atlantic (Simpson and Fox 2009) and shortnose sturgeon (O'Herron et al. 1993) habitat use and existing fine-scale habitat maps have been created through DE-DNREC's Delaware Bay Benthic Mapping Program. In these locations (rkm 72-128) we will utilize a stratified (depth) random design as previous telemetry work has shown that both Atlantic (Fox and Simpson 2007) and shortnose sturgeon (ERC 2006) are actively selecting for deepwater habitats. In selected areas we will deploy side-scan sonar (Edgetech 4125-P 1250 kHz high frequency search and recovery system) and conduct transects (n=>50 @ 500m length) along specified bathymetric contours on at least a quarterly basis. Information gained in the field will be stored on a lap top computer and analyzed at a later date. During the analysis phase we will enumerate and measure likely sturgeon targets, utilizing the digital high frequency side-scan sonar's minimal range (objects perpendicular to the transect) and transverse (objects parallel to the transect) resolutions of 2 cm and 5 cm, at a range of 25 meters, and 3 mm and 8 mm, at a range of 10 m, respectively (Quinn et al., 2005; Edgetech, 2007). We will ground truth this remote sensing data in at least 20% of all transects through the use of multi-mesh gillnets. Soak times will be kept short to minimize the risk of by-catch mortality. Collections from gillnets will be measured and identified to species to allow for an independent assessment of the faunal assemblage.

In the second and third years of the planned project we will expand our study to include areas that have not been previously mapped by the State of Delaware's ongoing program. This region which has not yet been surveyed contains both the known spawning location of shortnose sturgeon (? rkm 220; O'Herron et al. 1993) and the region we hypothesize Atlantic sturgeon are currently using for spawning (Simpson and Fox 2007). During the expected spawning season of Atlantic sturgeon (May-June) we will concentrate our sampling effort and utilize a stratified (depth and substrate) random design to assess adult (>1.3 m) Atlantic sturgeon habitat use. This will allow us to remotely assess the habitat use of adult Atlantic sturgeon during the period of likely spawning as well as assess the habitat use by smaller sturgeon (juvenile Atlantic and adult and juvenile shortnose)

Objective 3 (fishery independent monitoring): Adult and large juvenile Atlantic sturgeon will be captured beginning in late March/early April and concluding by mid May, using gillnets and techniques similar to those developed in the Atlantic sturgeon coastal intercept fishery before its closure in 1998. Monofilament anchor gillnets consisting of up to twenty panels (91.0m x 6.1m) strung together will be fished as one long net. I will employ mesh sizes ranging from 22.9 to 40.6cm stretch mesh, with a twine sizes ranging from 0.90-1.20 mm, and a hanging ratio of 0.5. Up to three strings of gillnets will be fished daily during suitable conditions for 7-10 hours each day and tended every 2-3 hours to reduce bycatch and minimize stress and potential mortality of Atlantic sturgeon. Gillnets are compliant with large whale take reduction measures and outfitted with acoustic pingers (Fumunda, 10 kHz, 132 dB) at the beginning of the net and at the junction of each gillnet panel to help deter marine mammal interactions. Upon collection Adult and juvenile Atlantic sturgeon will be handled according to the protocols previously described under objective 1.

Water temperature, and salinity will be recorded at the start of each gillnetting location using a Yellow Springs Institute, YSI 85 and substrate samples will be taken using a Petite Ponar® to determine bottom composition at each end of the netting location. Soak time will be recorded as the time when the net first enters the water until the completion of hauling. The start and end points of each net deployment will be recorded with a GPS and depth will be recorded with a hull mounted echosounder.

Upon collection Adult and juvenile Atlantic sturgeon will be handled according to the protocols previously described under objective 1. Additionally we will outfit up to 50 adult and or large juvenile Atlantic sturgeon with Sop-off Satellite Transmitters (PSATs) to provide insights into coastal migrations and habitat use. Information provided through this planned study will be used to better design our coastal surveys as well as provide

information to NOAA-NMFS on the spatial-temporal components of Atlantic sturgeon marine habitat use. We will utilize the methods developed by Erickson et al. 2011); specifically, we will utilize Microwave Telemetry PT-100 Archival Pop-up transmitters or another suitable model. The PSAT will be attached to 180-kg (tensile 87 strength) monofilament that was passed through the base of the dorsal fin using a size 88 tagging needle (Erickson and Hightower, 2007).

Sample Size Justification:

Objective 1 (Spawning Site Identification): we request permission to collect and retain up to 50 fertilized Atlantic sturgeon eggs per year for species identification and to assess maternal contribution/spwning success. These samples will be retained at DSU. In addition, we request permission to collect up an additional 300 Atlantic sturgeon eggs per year. These additional eggs will be enumerated and returned to the river in <90s to ensure hatching success. A similar approach has been used successfully with Gulf of Mexico sturgeon (K. Sulak, USGS personal communication). I also request permission to capture and implant acoustic transmitters in up to 60 adult Atlantic sturgeon annually during their spring migration. Since 2009 we have implanted > 100 adult Atlantic sturgeon with acoustic transmitters off the coast of DE. To date, less than 10% have entered the Delaware River. This fact when coupled with genetic assignments of captured sturgeon indicate the Delaware River contribution to the coastal stock is very small necessitating the tagging of large numbers of Atlantic sturgeon to ensure adequate numbers of Atlantic sturgeon will actually enter the river.

Objective 2 (hydroacoustic assessment): we request permission to collect up to 300 juvenile Atlantic sturgeon and 150 juvenile and adult shortnose sturgeon annually as part of the hydroacoustic assessment project. We estimate that we will be conducting on average 50 gillnet sets annually for the period of 2011-2013. Although we will be randomly selecting netting locations based on a stratified (depth) random design and soak times will be low we may still encounter concentrations of both shortnose and Atlantic sturgeon necessitating the need for 100 juveniles of each species per year.

Objective 3 (fishery independent monitoring): we request permission to collect up to 300 adult and large juvenile Atlantic sturgeon annually in our coastal sampling program. Since this fishery independent project will be focused on assessing population recovery we will need to collect sufficient number of Atlantic sturgeon given the low probability of recapture (<5% over three years (D. Fox: unpublished data). By continuing to collect large numbers of Atlantic sturgeon we hope to provide a source of tagged (both PIT and acoustic transmitters) individuals for future population assessments. Additionally we seek permission to deploy pop-off satellite transmitters (PSATs) on up to 50 adult and large juvenile Atlantic sturgeon annually to provide information on marine migrations and habitat use to better improve survey designs. Funding for the PSATs has not been secured but we hope to obtain it in the near future. The 50 adults and large juveniles that are outfitted with PSATs will also be outfitted with PIT and acoustic tags.

Supplemental Information

Status of Species:	Shortnose sturgeon received protection under the 1966 Endangered Species Preservation Act; their endangered status conveyed under the Endangered Species Act (1973). Peak coastal harvest of Atlantic sturgeon occurred in 1890 but fell by more than 98% by the 1920s (Hildebrand & Schroeder 1928). A coast-wide moratorium on fishing for Atlantic sturgeon was enacted by the Atlantic States Marine Fisheries Commission (ASMFC) in 1998. The Atlantic sturgeon status review (ASSRT 2007) concluded that the Carolina, Chesapeake Bay, and the New York Bight distinct population segments (DPSs) were at a "moderately high risk...of becoming endangered in the next 20 years."
Lethal Take:	We request permission to collect and retain up to 50 fertilized Atlantic sturgeon eggs per year for species identification and to assess maternal contribution/spwning success. These samples will be retained at DSU. It is not possible to assess maternal contribution without the killing the developing embryo. Additional eggs (up to 300/year) will be returned to the water immediately after being counted; a process that takes < 1 minute.
Anticipated Effects on Animals:	Overall, I do not anticipate any long term adverse physiological effects of the proposed research program on Atlantic and shortnose sturgeons. The assessment of impacts through directed sampling can be broken down into collection, handling, marking, and cumulative stress. Collection: since the initiation of our directed sampling efforts in 2004 my lab has collected a total of 373 juvenile and adult Atlantic sturgeon. A total of 154 individuals have been implanted with acoustic transmitters during this same time period. To date, we do not have any records of post-release mortality or transmitter loss which is indicative of limited/no adverse effects as a result of sampling. In fact, our only documented mortalities (n=3) occurred at the start of our coastal sampling in 2009. After these mortalities occurred changes were implemented in our sampling strategy (i.e. shortened soak times and no overnight soaks) and we have not incurred any additional mortalities. Handling: assessment of handling effects can be difficult; however the absence of any known post-release mortality/tag expulsion events with a large sample size is indicative of limited adverse impacts. Our handling protocols do not appear to impact the spawning behavior of individuals as both males and females who were classified as ripe (Van Eenennaam et al. 1996) at the time of transmitter implantation have

occupied likely spawning areas and have not behaved any differently than Atlantic sturgeon tagged in previous years occupying the same regions.
Marking: the collection of tissue samples and or the insertion of PIT, t-bar, or acoustic transmitters introduces the possibility of a secondary infection. This risk is minimized through the use of a broad spectrum prophylactic antibiotic and sterilized equipment/tags. Short term effects are minimized through the use of low dosages of anesthesia coupled with an onboard recovery tank and the requirement that Atlantic sturgeon be able to maintain their equilibrium prior to release.
Cumulative Stress: each activity outlined in the research plan should not show any long term sign of stress (i.e. after absorption of sutures and healing at approximately 30 days) individually. However, the sum of these activities may induce some visible signs of stress including reddening of the fins, inflation of the swim bladder, and secondary infections.

Risks to Non-listed Bycatch:
It is possible that our capture activities (i.e. gillnetting) may result in unintentional capture and/or
mortality of the non-target species listed below:

Coastal Sampling: bluefish (Pomatomus saltatrix), weakfish (Cynoscion
regalis), striped bass (Morone saxatilis), sand tiger (Carcharias taurus), winter skate (Leucoraja ocellata), little skate (Leucoraja erinacea), monkfish (Lophius americanus), horseshoe crab (Limulus polyphemus), summer flounder (Paralichthys dentatus), smooth dogfish (Mustelus canis), spiny dogfish (Squalus acanthias)

Riverine Species: channel catfish (Ictaluras punctatus), white catfish (Ameiurius Catus) and flathead catfish (Pylodictis olivaris), white perch (Morone americana), yellow perch (Perca flavescens)

Measures to Minimize Effects: Placeholder to get other stuff loaded

Resources Needed to Accomplish Objectives: Principal Investigator D. Fox has much experience working with sturgeons (Damon-Randall 2010, Simpson and Fox 2009, Fox et
al. 2000; Hightower et al. 2002; Fox et al. 2002) and has helped lead two workshops on sturgeon techniques (AFS Ottawa 2008, USFWS/NMFS Panama City, FL 2010).
CI M. Breece will assist in field operations. He has experience in all aspects of sturgeon handling including the implantation of transmitters.
CI L.M. Brown will assist in field operations. She has experience in all aspects of sturgeon handling including the implantation of transmitters.
CI K. W. Wark will assist in the collection and handling of Atlantic sturgeon in marine waters. Mr. Wark has many years of experience handling sturgeon including scientific collections.

Disposition of Tissues: Genetic samples will be collected and stored in 95% ETOH. Upon return to DSU the samples will be split and a small amount retained for archiving at DSU. The remaining samples will be shipped to the NOAA DNA sturgeon archive in Charleston, SC for storage and public use.

Public Availability of Product/Publications: Result of this work will be reported through interim and final reports. Additionally, key findings will be presented at regional and national scientific meeting and published in the peer-reviewed scientific literature. Information on telemetered Atlantic sturgeon will be provided to the Atlantic Coast Telemetry Network. Both telemetered and non-telemetered individuals will be reported to the USFWS sturgeon database.

Location/Take Information

Location

Research Area: Atlantic Ocean **State:** DE **Stream Name:** Atlantic Ocean **Latitude North:** 38.610 **Latitude South:** 38.450 **Longitude East:** 74.921 **Longitude West:** 75.033
Location Description: Adult Atlantic sturgeon sampling will take place in marine waters 3 to 15km off the coast of DE in the region of the DE/MD border (Figure 1)

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date

1		Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Adult/ Juvenile	Male and Female	300	1	Capture/Handle/Release	Net, Gill	Mark, Floy T-bar; Mark, PIT tag; Measure; Photograph/Video; Sample, fin clip; Weigh	N/A	4/4/2012	4/5/2017
	Details: Fishery Independent Monitoring/Coastal Sampling Program													
2	C	Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Adult/ Juvenile	Male and Female	60	1	Capture/Handle/Release	Net, Gill	Anesthetize; Instrument, external (e.g., VHF, satellite); Instrument, internal (e.g., VHF, sonic); Mark, Floy T-bar; Mark, PIT tag; Measure; Photograph/Video; Sample, fin clip; Sample, gonadal tissue biopsy; Weigh	N/A	4/16/2015	4/5/2017
	Details: Fishery Independent Monitoring/Coastal Sampling Program. External tags only to 40 out of the 60.													
3	C	Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Adult/ Juvenile	Male and Female	50	1	Capture/Handle/Release	Net, Gill	Instrument, external (e.g., VHF, satellite); Mark, Floy T-bar; Mark, PIT tag; Measure; Photograph/Video; Sample, fin clip; Weigh	N/A	4/16/2015	4/5/2017
	Details: Fishery Independent Monitoring. External tag=PSAT; (Year 2-5)													

Location

Research Area: Atlantic Ocean **States:** DE,NJ **Stream Name:** Delaware River Estuary **Latitude North:** 40.194 **Latitude South:** 39.614 **Longitude East:** 74.722 **Longitude West:** 75.616
Location Description: Mainstem waters of the Delaware River beginning at the Chesapeake and Delaware (C&D, RKM 94) Canal and extending upstream to Trenton, NJ (RKM 210) (Figure 2)

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Takes Per Animal	Take Action	Observe /Collect Method	Procedure	Transport Record	Begin Date	End Date
1		Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Egg	Unknown	50	1	Intentional (Directed) Mortality	Egg mat	Collect eggs	N/A	4/4/2012	4/5/2017
	Details: Spawning Site Identification													
2		Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Egg	Unknown	300	1	Intentional (Directed) Mortality	Egg mat	Collect eggs	N/A	4/4/2012	4/5/2017
	Details: Spawning Site Identification: Eggs will be counted and returned live to river.													
3		Sturgeon, Atlantic	New York Bight (NMFS Endangered)	Wild	Juvenile	Male and Female	100	1	Capture/Handle/Release	Net, Gill	Mark, PIT tag; Measure; Photograph/Video; Sample, fin clip; Weigh	N/A	4/4/2012	4/5/2017
	Details: Hydroacoustic Assessment: DIDSON will be used													
4		Sturgeon, shortnose	Range-wide (NMFS Endangered)	Wild	Juvenile	Male and Female	100	1	Capture/Handle/Release	Net, Gill	Mark, PIT tag; Measure; Photograph/Video; Sample, fin clip; Weigh	N/A	4/4/2012	4/5/2017
	Details: Hydroacoustic Assessment: DIDSON will be used													

NEPA Checklist

1) If your activities will involve equipment (e.g., scientific instruments) or techniques that are new, untested,or otherwise have unknown or uncertain impacts on the biological or physical environment , please discuss the degree to which they are likely to be adopted by others for similar activities or applied more broadly.

Our techniques are not new or untested. All of our protocols will follow NMFS guidelines (e.g., Damon-Randall et al. 2010; Kahn and Mohead 2010.)

2) If your activities involve collecting, handling, or transporting potentially infectious agents or pathogens (e.g., biological specimens such as live animals or blood), or using or transporting hazardous substances (e.g., toxic chemicals), provide a description of the protocols you will use to ensure public health and human safety are not adversely affected, such as by spread of zoonotic diseases or contamination of food or water supplies.

Tissue samples and eggs would be preserved in 95% ETOH, sealed in vials, labeled and transported safely to our labs for later analysis.

3) Describe the physical characteristics of your project location, including whether you will be working in or near unique geographic areas such as state or National Marine Sanctuaries, Marine Protected Areas, Parks or Wilderness Areas, Wildlife Refuges, Wild and Scenic Rivers, designated Critical Habitat for endangered or threatened species, Essential Fish Habitat, etc. Discuss how your activities could impact the physical environment, such as by direct alteration of substrate during use of bottom trawls, setting nets, anchoring vessels or buoys, erecting blinds or other structures, or ingress and egress of researchers, and measures you will take to minimize these impacts.

Our research would not take place in any of these protected areas. The anchors for our gill nets would have only very minimal effect on the substrate (mostly mud).

4) Briefly describe important scientific, cultural, or historic resources (e.g., archeological resources, animals used for subsistence, sites listed in or eligible for listing in the National Register of Historic Places) in your project area and discuss measures you will take to ensure your work does not cause loss or destruction of such resources. If your activity will target marine mammals in Alaska or Washington, discuss measures you will take to ensure your project does not adversely affect the availability (e.g., distribution, abundance) or suitability (e.g., food safety) of these animals for subsistence uses.

Our research will not disturb or effect any scientific, historical or cultural resources.

5) Discuss whether your project involves activities known or suspected of introducing or spreading invasive species, intentionally or not, (e.g., transporting animals or tissues, discharging ballast water, use of equipment at multiple sites). Describe measures you would take to prevent the possible introduction or spread of non-indigenous or invasive species, including plants, animals, microbes, or other biological agents.

To prevent the spread of invasive species, and as a matter of basic maintenance, we clean our boats after every use (flush out engine, hose down boat) and between uses at different sites.

Project Contacts

Primary Contact: Dewayne Fox

Principal Investigator: Dewayne Fox

Other Personnel:

Name	Role(s)
Matthew Breece	Co-Investigator
Lori Mae Brown	Co-Investigator
Kevin W Wark	Co-Investigator

Attachments

Application Archive - P16507T14Issued.pdf (Added Apr 5, 2012)

Contact - Dewayne Fox: C14257T58-10_D.Fox_short_C.V.docx (Added May 27, 2011)

Location - L32394T3Figure 1_Marine Collections.docx (Added Jul 28, 2011)

Location - L32396T3Figure 2_Riverine Collections.docx (Added Jul 28, 2011)

Resources Needed - P16507T15Atlantic sturgeon (OPR-AFCA_DuPONT CITF)_2010.doc (Added Jul 28, 2011)

Resources Needed - P16507T15Breece_Curriculum_Vitae_8_16_11.docx (Added Aug 22, 2011)

Resources Needed - P16507T15Fox Initial Clarification Request 03-12-10.doc (Added Jul 28, 2011)

Resources Needed - P16507T15Fox Sturgeon Approval - 06-17-10.docx (Added Jul 28, 2011)

Resources Needed - P16507T15Kevin_Wark_CV[1].docx (Added Aug 22, 2011)

Resources Needed - P16507T15LM_Brown_CV_2011.docx (Added Aug 22, 2011)

Status

Application Status: Application Complete
Date Submitted: May 11, 2011
Date Completed: July 19, 2011
FR Notice of Receipt Published: September 21, 2011 **Number:** 0648-XA713
Comment Period Closed: October 21, 2011 **Comments Received:** Yes **Comments Addressed:** Yes
Last Date Archived: April 17, 2015

- **ESA Section 10(a)(1)(A) permit (other)**
  Current Status: Issued **Status Date:** April 4, 2012
  Section 7 Consultation: Formal Consultation
  NEPA Analysis: Environmental Assessment
  Date Cleared by General Counsel: March 26, 2012
  FR Notice of Issuance/Denial Published: April 11, 2012 **Notice Number:** 0648-XA713
  Expire Date: April 5, 2017

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Modification Requests

Modifications Requested

Number	Title	Description	Status	Date Submitted	Date Issued	Issued Version
1	Add endangered shortnose sturgeon to the permit.	Permit 16507-01.	Issued	01/26/2015	02/05/2015	P16507T14Mod1.pdf
2	Add Dr. Keith Dunton as CI	I would like to add Dr. Keith Dunton as a co-investigator on our existing permit (16507-01). (Dewayne Fox)	Issued	01/26/2015	02/06/2015	P16507T14Mod2.pdf
3	Allow double tagging of Atlantic sturgeon	We are requesting double tagging Atlantic sturgeon; external tags are requested for 40 out of the 60 sturgeons already authorized to be implanted with internal tags. Pleease see attachment. Note from PR1: The procedure "Sample, gonadal tissue biopsy" was removed from the row reflecting the 50 Atlantic sturgeon that may be fixed with external tags as it seemed to be an error.	Issued	02/16/2015	04/16/2015	

Reports

Reports Required

Nbr	Report Type	Report Period		Date Due	Status	Date Received
		Start Date	End Date			
1	Annual	04/06/2012	04/05/2013	07/05/2013	N/A	
2	Annual	04/06/2013	04/05/2014	07/05/2014	N/A	
3	Annual	04/06/2014	04/05/2015	07/05/2015	N/A	
4	Annual	04/06/2015	04/05/2016	07/05/2016	N/A	
5	Annual	04/06/2016	04/05/2017	07/05/2017	N/A	
6	Final	04/06/2012	04/05/2017	10/02/2017	N/A	